

DMITRY CHELKAK – CURRICULUM VITAE

• **General:**

- Name: **Dmitry Chelkak**
- Birthday/place: Jan 1979/St. Petersburg (former Leningrad, USSR)
- Family status: married, two children: Aleksandra (2006), Mikhail (2017)
- Languages: English, French, Russian
- E-mail address: `dchelkak@umich.edu`

• **Employment:**

- Fall 2022 – ... : Keeler Professor, University of Michigan (Ann Arbor)
- 2016/17 – 2021/22 : professor, ENS-MHI Chair, École Normale Supérieure (Paris)
- 2015/16 : visiting professor, University of Geneva
- 2014/15 : senior fellow, Institute for Theoretical Studies, ETH Zürich
- 2009 – ... : [on leave since 2014] senior researcher, Mathematical Analysis Laboratory at St. Petersburg Department of Steklov Institute (PDMI RAS)
- 2010 – 2014 : senior researcher, Chebyshev Lab at St. Petersburg University (SPbSU)
- 2006/07 : senior research assistant, University of Geneva
- 2004 – 2010 : docent (associate professor), Dept. of Mathematical Analysis at SPbSU

• **Education:**

- Dec 2003: PhD (PDMI RAS, St. Petersburg, co-advisors: P. Kargaev & E. Korotyaev)
“Inverse problem for the 1D harmonic oscillator perturbed by a potential”
- 2000 – 2003: PhD student (SPbSU & Potsdam University, Germany)
- 1995 – 2000: St. Petersburg University (SPbSU), *diploma cum laude*

• **Awards:**

- 2014: Salem Prize
- 2008: Pierre Deligne Contest Award (research scholarship for 2009–2011)
- 2004: “Young Mathematician” Prize of the St. Petersburg Math. Society
- 1995: Gold Medal of IMO (36th Int. Math. Olympiad of school students, Toronto)

• **Selected Talks:**

- ICM2018 (International Congress of Mathematicians, Rio de Janeiro, August 2018):
“Planar Ising model at criticality: state-of-the-art and perspectives”
(invited, “Analysis and Operator Algebras” & “Probability and Statistics” sections)
- ICMP2018 (International Congress on Mathematical Physics, Montreal, July 2018):
“Tau-functions à la Dubédat and cylindrical events in the double-dimer model”
(invited, “Equilibrium Statistical Mechanics” session)
- SPA2017 (Stochastic Processes and Their Applications, Moscow, July 2017):
“2D Ising model: correlations, interfaces and a priori estimates” (plenary)
- ECM2016 (European Congress of Mathematics, Berlin, July 2016):
“2D Ising model: correlations via boundary value problems”
(invited, “Applied Mathematics and Probability” section)

- **Research Interests:** interplay of Complex Analysis, Probability & Mathematical Physics [notably planar Ising and bipartite dimer models, discrete holomorphicity and SLE/CLEs]

• **Administrative Activity and Other Services:**

- *Chebyshev Lab at SPbSU* (established in Dec 2010 under the ‘megagrant’ program of the Russian Federation Government, project leader: Prof. Stanislav Smirnov):
Spring 2011: vice head, Fall 2011: acting head.
- Summer School “*St. Petersburg School in Probability and Statistical Physics – 2012*” (two weeks, 150+ participants), member of the Organizing Committee;
- 2009–2014: member of the St. Petersburg Mathematical Society Council;
- reviewer for a number of mathematical and physical journals.

• **Research grants:**

- Paris 2019–2022: member of the ANR-18-CE40-0033 project DIMERS (Paris–Lyon)
- St. Petersburg 2010–2014: principal member of the ‘megagrant’ 11.G34.31.0026 of the Russian Federation Government ($\sim 1\text{M}\$$ per year, project leader: S. Smirnov).
- St. Petersburg 2008–2012: several starting grants: MK-4306.2008.1, MK-7656.2010.1, Pierre Deligne Contest Award (research scholarship for 2009-2011).

• **Students supervised:**

- *ÉNS Paris*:
 - * Postdocs: Sanjay Ramassamy(2018/19); Niklas Affolter, Mikhail Basok(2021/22);
 - * PhD: Rémy Mahfouf, Yijun Wan (both 2018/19–2021/22);
 - * master: Hugo Falconet (P6, 2017), Chengyang Shao (ENS-Tsinghua exchange program, 2017), Rémy Mahfouf (Paris XI, 2018), Yijun Wan (Paris VI, 2018);
- *Université de Genève*:
 - * PhD: Marianna Russkikh (2014/15–2018/19, joint supervision with S. Smirnov);
- *Saint-Petersburg State University*:
 - * master: Sergey Matveenko (2009), Alexey Vorotov (2010), Pavel Lepekhin (2011).

• **Selected papers:**

- Dmitry Chelkak, Ising model and s-embeddings of planar graphs. [arXiv:2006.14559](https://arxiv.org/abs/2006.14559), to appear in *Ann. Sci. Éc. Norm. Supér.* (2024).
- Mikhail Basok, Dmitry Chelkak, Tau-functions à la Dubédat and probabilities of cylindrical events for double-dimers and CLE(4), *J. Eur. Math. Soc. (JEMS)*, 23 (2021), no. 8, 2787–2832.
- Dmitry Chelkak, Robust discrete complex analysis: a toolbox, *Ann. Probab.* 44 (2016), no. 1, 628–683.
- Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Conformal invariance of spin correlations in the planar Ising model, *Ann. Math.* 181 (2015), no. 3, 1087–1138.
- Dmitry Chelkak, Stanislav Smirnov, Universality in the 2D Ising model and conformal invariance of fermionic observables, *Invent. Math.*, 189 (2012), no. 3, 515–580.
- Dmitri Chelkak, Pavel Kargaev, Evgeni Korotyaev, Inverse problem for harmonic oscillator perturbed by potential: characterization. *Comm. Math. Phys.* 249 (2004), no. 1, 133–196.

• **Teaching experience:**

- **University of Michigan, Ann Arbor (2022/23 – ...):**
Winter 2023: MATH710 ‘*Conformal invariance in 2d statistical physics*’
- **ÉNS Paris (2016/17 – 2021/22):**
‘*Processus stochastiques*’ (M1 level): discrete time martingales (optional stopping, inequalities, convergence), Markov chains, intro to the Brownian motion;
‘*Topologie et calcul différentiel*’ (L3 level): general topology, basic notions of functional analysis, calculus and differential equations in Banach spaces.
- **Université de Genève (2015/16):** ‘*Brownian motion and stochastic calculus*’ (part of a one-year SwissMAP master class in planar statistical physics).
- **Saint-Petersburg University (2004 – 2010):**
Extensive teaching: $(6+) \times 90$ min per week on average, both lectures and TA sessions
Standard curriculum: ‘Mathematical Analysis – I, II, III’ (basic calculus, several variables, complex variable, measure theory, Fourier analysis, functional analysis);
Advanced courses: ‘Inverse Sturm–Liouville problem’, ‘Extensions of symmetric operators’, ‘Spectral theory of self-adjoint operators’;
Honors courses (advanced group of 2nd year students): ‘Divergent series and prime numbers’, ‘Intro to entire functions’, ‘Intro to smooth manifolds’, ‘Intro to fractals’.
- **High-school level (1995–2000):** teaching and organization duties in ‘mathematical circles’, from local to all-Russia events and Russian IMO team training schools.

• **Research-oriented mini-courses:**

- *Winter School in Mathematical Physics at Les Diablerets (2018)*,
Virginia Integrable Probability Summer School (2019):
‘Planar Ising model: from combinatorics to CFT and s-embeddings’.
- *ETH Zürich (2014/15):* reading group ‘Conformal invariance of spin correlations in the planar Ising model’; mini-course ‘Ising correlations and orthogonal polynomials’;
- *Moscow Independent University (2013):* ‘Spin correlations in the 2D Ising model’,
Dubna summer school (2013): ‘Planar random walks and their limits: SRW, LERW and SAW’;
- *YEP Workshop ‘Two-dimensional statistical mechanics’, Eindhoven (2012):* ‘Discrete complex analysis on the microscopic level: conformal invariants without conformal invariance’;
- *Tel-Aviv University (2009):* ‘Conformal invariance in the 2D Ising model’;
- *Saint-Petersburg (2008–2014):* ‘SLE (Schramm-Loewner evolution)’ (2008), ‘Dimers on planar graphs and GFF’ (2008, 2011), ‘Intro to the conformal invariance of lattice models’ (2010), ‘Random walk in domino world’ (2014);

DMITRY CHELKAK – LIST OF PUBLICATIONS

• **Recent preprints:**

- [1] Dmitry Chelkak, Benoît Laslier, Marianna Russkikh, Bipartite dimer model: perfect t-embeddings and Lorentz-minimal surfaces. [arXiv:2109.06272](#)
- [2] Dmitry Chelkak, Konstantin Izyurov, Rémy Mahfouf, Universality of spin correlations in the Ising model on isoradial graphs. [arXiv:2104.12858](#), to appear in *Ann. Probab.*
- [3] Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Correlations of primary fields in the critical planar Ising model. [arXiv:2103.10263](#)
- [4] Dmitry Chelkak, Ising model and s-embeddings of planar graphs. [arXiv:2006.14559](#), to appear in *Ann. Sci. Éc. Norm. Supér.*
- [5] Dmitry Chelkak, Sanjay Ramassamy, Fluctuations in the Aztec diamonds via a Lorentz-minimal surface. [arXiv:2002.07540](#)
- [6] Dmitry Chelkak, Benoît Laslier, Marianna Russkikh, Dimer model and holomorphic functions on t-embeddings of planar graphs. [arXiv:2001.11871](#), to appear in *Proc. Lond. Math. Soc.*
- [7] Dmitry Chelkak, Clément Hongler, Rémy Mahfouf, Magnetization in the zig-zag layered Ising model and orthogonal polynomials. [arXiv:1904.09168](#), to appear in *Ann. Inst. Fourier*

• **Published:**

- [8] Mikhail Basok, Dmitry Chelkak, Tau-functions à la Dubédat and probabilities of cylindrical events for double-dimers and CLE(4), *J. Eur. Math. Soc. (JEMS)*, 23 (2021), no. 8, 2787–2832.
- [9] Dmitry Chelkak, Yijun Wan, On the convergence of massive loop-erased random walks to massive SLE(2) curves. *Electron. J. Probab.*, 26 (2021), paper no. 54, 1–35.
- [10] Dmitry Chelkak, Planar Ising model at criticality: state-of-the-art and perspectives. In *Proceedings of the International Congress of Mathematicians 2018 (ICM 2018)*, Vol. 3, pages 2789–2816. World Scientific Publishing Company Inc., 2019
- [11] Dmitry Chelkak, 2D Ising model: correlation functions at criticality via Riemann-type boundary value problems. In *European Congress of Mathematics: Berlin, 18-22 July, 2016*, pages 235–256. European Mathematical Society, Zürich, 2018.
- [12] Dmitry Chelkak, David Cimasoni, Adrien Kassel, Revisiting the combinatorics of the 2D Ising model, *Ann. Inst. Henri Poincaré D* 4 (2017), no. 3, 309–385.
- [13] Dmitry Chelkak, Robust discrete complex analysis: a toolbox, *Ann. Probab.* 44 (2016), no. 1, 628–683.
- [14] Dmitry Chelkak, Hugo Duminil-Copin, Clément Hongler, Crossing probabilities in topological rectangles for the critical planar FK Ising model, *Electron. J. Probab.*, 21 (2016), paper no. 5, 1–28.
- [15] Dmitry Chelkak, Clément Hongler, Konstantin Izyurov, Conformal invariance of spin correlations in the planar Ising model, *Ann. Math.* 181 (2015), no. 3, 1087–1138.
- [16] Dmitry Chelkak, Hugo Duminil-Copin, Clément Hongler, Antti Kemppainen, Stanislav Smirnov, Convergence of Ising interfaces to Schramm’s SLE curves, *C. R. Acad. Sci. Paris, Ser. I* 352 (2014), 157–161.
- [17] Dmitry Chelkak, Konstantin Izyurov, Holomorphic spinor observables in the critical Ising model, *Comm. Math. Phys.* 322 (2013), no. 2, 303–332.

DMITRY CHELKAK – LIST OF PUBLICATIONS (CONTINUED)

- [18] Dmitry Chelkak, Stanislav Smirnov, Universality in the 2D Ising model and conformal invariance of fermionic observables, *Invent. Math.*, 189 (2012), no. 3, 515–580.
 - [19] Dmitry Chelkak, Stanislav Smirnov, Discrete complex analysis on isoradial graphs, *Advances in Mathematics*, 228 (2011), no. 3, 1590–1630.
 - [20] An application of the fixed point theorem to the inverse Sturm-Liouville problem. Chelkak, D.: *Записки научных семинаров ПОМИ*, 370 (2009), 203–218.
English translation: *J. Math. Sci.* 166 (2010), no. 1, 118–126.
 - [21] Обратная задача Штурма-Лиувилля со смешанными краевыми условиями, Е. Л. Коротяев, Д. С. Челкак: *Алгебра и анализ*, 21 (2009), no. 5, 114–137.
English translation: The inverse Sturm–Liouville problem with mixed boundary conditions. *St. Petersburg Math. J.* 21 (2010), no. 5, 761–778.
 - [22] Weyl-Titchmarsh functions of vector-valued Sturm–Liouville operators on the unit interval. Chelkak, D.; Korotyaev, E.: *Journal of Functional Analysis* 257 (2009), 1546–1588.
 - [23] The inverse problem for perturbed harmonic oscillator on the half-line with a Dirichlet boundary condition. Chelkak, D.; Korotyaev, E.: *Ann. Henri Poincaré* 8 (2007), no. 6, 1115–1150.
 - [24] Parametrization of the isospectral set for the vector-valued Sturm-Liouville problem. Chelkak, D.; Korotyaev, E.: *Journal of Functional Analysis* 241 (2006), 359–373.
 - [25] Spectral estimates for Schrodinger operator with periodic matrix potential on the real line. Chelkak, D.; Korotyaev, E.: *Int. Math. Res. Not.*, 2006, Article ID 60314, 1–41.
 - [26] Inverse problem for harmonic oscillator perturbed by potential, characterization. Chelkak, D.; Kargaev, P.; Korotyaev, E.: *Comm. Math. Phys.* 249 (2004), no. 1, 133–196.
 - [27] Inverse problem for harmonic oscillator perturbed by potential. Chelkak, D.; Kargaev, P.; Korotyaev, E.: Inverse problems and spectral theory, 93–102, *Cont. Math.* 348, AMS, Providence, RI, 2004.
 - [28] Асимптотика спектральных данных гармонического осциллятора, возмущенного потенциалом с конечной энергией. Д. С. Челкак: *Зап. Науч. Сем. ПОМИ* 303 (2003) 223–271. English translation: Asymptotics of spectral data of a harmonic oscillator perturbed by a potential. *J. Math. Sci.* 129 (2005), no. 4, 4053–4082.
 - [29] Аппроксимация в пространстве спектральных данных возмущенного гармонического осциллятора. Д. С. Челкак: *Проблемы Мат. Анализа* 26 (2003) 287–300.
English translation: Approximation in the space of spectral data of a perturbed harmonic oscillator. *J. Math. Sci.* 117 (2003), no. 3, 4260–4269.
 - [30] An inverse problem for an harmonic oscillator perturbed by potential: uniqueness. Chelkak, D.; Kargaev, P.; Korotyaev, E.: *Lett. Math. Phys.* 64 (2003), no. 1, 7–21.
- **Unpublished preprints:**
- [31] Dmitry Chelkak, Alexander Glazman, Stanislav Smirnov, Discrete stress-energy tensor in the loop $O(n)$ model. [arXiv:1604.06339](https://arxiv.org/abs/1604.06339)
 - [32] Inverse vector-valued Sturm-Liouville problem. I. Uniqueness theorem. Dmitry Chelkak, Sergey Matveenko, [arXiv:1312.3621](https://arxiv.org/abs/1312.3621).
 - [33] Inverse spectral analysis for finite matrix-valued Jacobi operators. J. Bruning, D. Chelkak, E. Korotyaev, [arXiv:math/0607809](https://arxiv.org/abs/math/0607809).